

REMARKS

Reconsideration of the pending application is respectfully requested on the basis of the following particulars.

1. In the specification

A. Amendments

The specification is amended, as shown in the foregoing AMENDMENT TO THE SPECIFICATION, via the attached substitute specification, to be consistent with amendments to the drawings and to correct minor informalities. It is respectfully submitted that no new matter is added.

Entry of the AMENDMENT TO THE SPECIFICATION, via entry of the substitute specification, is respectfully requested in the next Office communication.

B. Objections to the specification

Reconsideration and removal of the objections to the specification is respectfully requested, in view of the amendments to the specification, on the basis that the minor informalities identified in the Office action have been corrected.

Accordingly, removal of the objections to the specification is respectfully requested.

2. In the drawings

A. Amendments

Figure 1 is presently amended in the REPLACEMENT SHEET of page 1 of the drawings. Specifically, reference numerals 24 and 25 that respectively identified the reservoir and pump of the cooling circuit have been replaced with reference numerals 40 and 41. It is respectfully submitted that no new subject matter is introduced, since only identification of already illustrated features is provided by way of the amendment.

Acceptance of the REPLACEMENT SHEET is respectfully requested in the next Office communication.

B. Drawing objections

Reconsideration and removal of the drawing objections is respectfully requested on the basis that the minor informalities identified in the Office action have been corrected, and since every feature of the claims is shown the drawing figures.

With regard to the recitations in claims 1 and 28 of the cooling channels being connected to the lubricant ducts, this feature is shown at least in Figs. 2-5 of the drawings as originally filed.

With regard to Fig. 1, the duplicate reference numerals 24 and 25 have been replaced with numerals 40 and 41, as discussed above.

With regard to claims 18 and 26, the claims have been amended to remove reference numerals to clarify which cooling channels are provided in the bearing cap or extend into the gasket.

In view of the above, it is respectfully submitted that every feature of the claims is shown the drawing figures, and that the minor informalities identified in the Office action have been corrected. Accordingly, removal of the drawing objections is respectfully requested.

3. In the claims

As shown in the foregoing LIST OF CURRENT CLAIMS, the claims have been amended to more clearly point out the subject matter for which protection is sought.

A. Claim amendments

Claims 16-29 are amended to remove the phrase "an improved." Claims 17, 18, 19, 22, and 26 are amended to correct various informalities identified in the Office action.

Claim 16 is also amended to clarify that the cooling channels are connected to the lubrication ducts in one hydraulic circuit.

It is respectfully submitted that no new matter is added.

Claims 1-15 remain cancelled.

Entry of the LIST OF CURRENT CLAIMS is respectfully requested in the next Office communication.

B. Rejection of claims 16-29 under 35 U.S.C. § 112 second paragraph

Reconsideration and withdrawal of this rejection is respectfully requested, in view of the amendments to the claims and the discussion below, on the basis that claims 16-29 are clear and definite.

With regard to claims 16-29, the phrase “an improved” has been removed for clarification.

With regard to claims 16 and 28, as discussed above, Figs. 2-5 illustrate how the cooling channels are connected to the lubricating ducts. This configuration is provided for various reasons listed at least on pages 3-4 in the substitute specification filed on August 22, 2006.

With regard to claim 17, the phrase “the above mentioned place” has been clarified by referring to the place between the rotor and the bearing, as is recited in claim 16.

With regard to claim 19, the phrase “the clearance” has been revised to provide proper antecedent basis.

With regard to claim 22, “to the sense” has been clarified to read the “direction.”

Accordingly, in view of the above amendments and discussion, it is respectfully submitted that each claim is clear and definite and withdrawal of this rejection is respectfully requested.

4. Rejection of claims 16 and 17 under 35 U.S.C. § 103(a) as being unpatentable over UK publication 585,346 (Constant) in view of U.S. patent no. 4,137,997 (Ando)

Reconsideration of this rejection is respectfully requested on the basis that the rejection fails to establish a *prima facie* case of obviousness with respect to amended claims 16 and 17.

The embodiment of amended claim 16 requires a machine with bearing lubrication. The machine includes a housing, a rotor provided on a shaft in a rotatable manner in the housing by oil-lubricated bearings. Inside the housing, lubrication ducts are provided to supply and discharge oil to and from the bearings and cooling channels are provided to supply and discharge a cooling agent. The cooling channels are open opposite to the shaft, in a place between the rotor and a bearing. The cooling channels are further connected to the lubrication ducts in one hydraulic circuit.

The proposed combination of the *Constant* publication and the *Ando* patent fails to disclose the structure recited in amended claim 16, and in particular fails to disclose cooling channels connected to lubrication ducts in one hydraulic circuit.

Turning to the *Constant* publication, a turbine provided with blades is disclosed. A gap 36 is provided between rows of blades and as such, a hot gas stream could leak through the gap and eventually reach the bearing 10.

In an attempt to reduce this effect, the *Constant* publication discloses introducing a cooling fluid in chamber 33 via duct 34. The cooling fluid that is introduced into the chamber 33 does not come into contact with the shaft end, and thus has almost no effect on the reduction of heat transfer through the shaft. As can be seen in the Figure, the outer surface of the chamber 33 is only in contact with the outer ring of the bearing for cooling the bearing, and is spaced from the shaft 9, such that the cooling fluid that is introduced into the chamber 33 does not cool the shaft 9.

Another measure disclosed in the *Constant* publication to reduce the flow of hot gas towards the bearing is the use of a blocking gas that is introduced through channel 38 and removed via channel 40. This blocking gas is provided to entrain the hot gasses that flow through the labyrinth packings 16, 17, 18 and will have only a very limited influence on the cooling of the shaft, as the heat transferring surface is small. Further, the blocking gas surrounds the shaft 9 between the outer surface of the chamber 33 and the shaft 9 to further prevent any cooling effect of the cooling fluid that is introduced into the chamber 33 on the shaft 9.

A separate circuit is provided via pipe 29 through orifice 30 to convey air and oil mist into the bearing housing, which air and oil mist is removed from the bearing housing via orifice 31 and drain pipe 32.

As can be seen, in particular in the Figure of the *Constant* publication, each of the disclosed cooling, gas entraining, or lubricating circuits are separately provided. Further, since each of the cooling, gas entraining, or lubricating circuits utilize a different cooling, entraining, or lubricating material, a skilled artisan would not have replaced the three distinct cooling, gas entraining, or lubricating circuits with a single hydraulic circuit, as is required by amended claim 16.

The Office action acknowledges on page 6 that the *Constant* publication fails to disclose cooling channels connected to lubricating ducts.

The Office action turns to the *Ando* patent to cure this deficiency of the *Constant* publication. However, as discussed in detail below, the *Ando* patent fails to disclose cooling channels connected to lubrication ducts in one hydraulic circuit, as is required by amended claim 16.

The *Ando* patent is drawn to a lubricating and cooling system for a spindle bearing assembly, where the lubricating oil passages and the cooling oil passages are separate from one another and are supplied from separate lubricating oil and cooling circuits so that the lubricating and cooling are controlled individually and selectively (abstract).

In particular, the *Ando* patent discloses lubrication channels 9 and cooling channels 12, 13, 13a, where the lubricating channels are supplied from a lubricating oil circuit 20 and the cooling channels 12, 13, 13a are supplied from a separate oil cooling circuit 28 (Fig.; col. 3, lines 4-35). While the lubricating oil circuit 20 and the separate oil cooling circuit 28 do share a common tank 20 and pump 22, the separate flow control valve 26 in the lubricating oil circuit 20 and the separate flow control valve 30 in the cooling oil circuit 28 cause two distinct hydraulic circuits to be formed, which can be individually and selectively controlled. This configuration is in contrast to amended claim 16, which requires cooling channels connected to lubrication ducts in one hydraulic circuit.

Thus, the *Ando* patent fails to disclose cooling channels connected to lubrication ducts in one hydraulic circuit, as is required by amended claim 16. Therefore, the proposed combination of the *Constant* publication and the *Ando* patent also fails to disclose cooling channels connected to lubrication ducts in one hydraulic circuit, as is required by amended claim 16.

Further, since the *Ando* patent specifically discloses separate cooling and lubricating circuits so that the lubricating and cooling are controlled individually and selectively, a person having ordinary skill in the art would not have replaced the distinct cooling and lubricating circuits with a single hydraulic circuit, as is required by amended claim 16.

Further, the structure of the *Ando* patent is insufficient for cooling and lubricating high speed motor applications. In particular, the channel 9 splits into three ducts, with the middle duct leading to a chamber positioned between two bearings and feeding two injection nozzles and the other two ducts leading to a ring-shaped chamber surrounding the outer ring of the bearing.

The ring-shaped chamber does not allow a flow through of the injected fluid, which means that the ring-shaped chamber does not provide for cooling. Instead, a static pressure build-up is used to obtain a damping effect on the bearings and is generally known as an "oil-film damper" (col. 2, lines 18-19).

The channels 13 are connected to ring shaped ducts provided around the other side of the outer rings of the bearings and do allow flow-through of a medium, as they are connected to outlet channels 14. Such flow-through, however, limits cooling to the outer rings of the bearings. The cooling of only the outer rings of the bearings in high speed motor applications would actually be very undesirable, since this would lead to a large temperature gradient through the bearing and would thus lead to increased friction and heat generation.

Further, although the channels 13a feed a cooling fluid to the spindle, this flow will not have the desired effect required in high speed motor applications, as the heat transferring surface is rather limited.

For these reasons, and in particular since the proposed combination of the *Constant* publication and the *Ando* patent fails to disclose cooling channels connected to lubrication ducts in one hydraulic circuit, as is required by amended claim 16, and since a skilled artisan would not have provided cooling channels connected to lubrication ducts in one hydraulic circuit, as is required by amended claim 16, a *prima facie* case of obviousness cannot be established, and withdrawal of this rejection is respectfully requested.

Claim 17 depends from claim 16 and is considered patentable as containing all of the features of claim 16, as well as for its own recited features.

In particular, the embodiment of amended claim 17 requires one or several grooves to be provided on the shaft at a place between the rotor and the bearing opposite to the cooling channels.

The Office action, on page 6, apparently identifies a groove provided on the rotor (drum 1) for connecting the shaft to the rotor/drum (presumably of the *Constant* publication). The apparent groove referred to in the Office action does not appear to be provided on the shaft at a place between the rotor and the bearing opposite to the cooling channels, as is required by amended claim 17.

This feature is also not disclosed in the *Ando* patent. While the *Ando* patent discloses grooves 12 in the spindle housing, these are not grooves formed in the shaft at a place between the rotor and the bearing opposite to the cooling channels, as is required by amended claim 17.

Accordingly, a *prima facie* case of obviousness cannot be established with respect to claim 17, and withdrawal of this rejection is respectfully requested.

5. Allowable subject matter

The applicant gratefully acknowledges the indication of allowable subject matter in claims 18-29. In view of the amendment to claim 16, however, the subject matter of claims 18-29 has not been rewritten in independent form.

6. Conclusion

As a result of the amendment to the claims, and further in view of the foregoing remarks, it is respectfully submitted that the application is in condition for allowance. Accordingly, it is respectfully requested that every pending claim in the present application be allowed and the application be passed to issue.

If any issues remain that may be resolved by a telephone or facsimile communication with the applicant's attorney, the examiner is invited to contact the undersigned at the numbers shown below.

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Respectfully submitted,

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